CLAIMS

1. A method of generating a transmission signal comprising a carrier signal, the method comprising the step of combining a plurality of subcarrier modulation signals with the carrier signal.

2. A method as claimed in claim 1 further comprising the step of generating at least one subcarrier modulation signal of the plurality of subcarrier modulation signals comprises a number, m, of amplitude levels, where $m \geq 2$.

3. A method as claimed in claim 2 wherein the step of generating the at least one modulation signal comprises the step of creating an signal having m amplitudes where $m>2$.

4. A method as claimed in either of claims 2 and 3 in which m is selected from at least one of 3, 4, 5, 6, 7, 8 or 9.

5. A method as claimed in any of claims in which at least one of the plurality of subcarrier modulation signals approximates or is derived from a predeterminable basis waveform.

6. A method as claimed in claim 5 in which the basis waveform is at least one of a sine wave, cosine wave, triangular waveform.

7. A method as claimed in either of claims 5 and 6 in which the basis waveform is selected according to desired power distribution characteristics of the transmission signal.

8. A method as claimed in any preceding claim in which at least two of the plurality of subcarrier modulation signals are mutually orthogonal.

9. A method as claimed in any preceding claim in which the plurality of subcarriers are mutually orthogonal.

10. A method as claimed in any preceding claim in which the plurality of subcarrier comprises a pair of subcarriers having a predetermined phase relationship.

11. A method as claimed in any preceding claim in which the plurality of subcarriers comprises an in-phase subcarrier and a quadrature phase subcarrier.

12. A method as claimed in claim 11 further comprising the step of determining the respective multiple amplitudes of the in-phase and quadrature phase subcarriers to maintain a substantially constant transmission signal envelope.

13. A method as claimed in any preceding claim further comprising the steps of deriving the amplitudes associated with at least a pair of orthogonal subcarriers from a plurality of phase states.

14. A method as claimed in claim 13, in which the phase states are equally angularly distributed around a unit circle.

15. A method as claimed in any of claims 2 to 14 in which durations of the amplitudes of at least one subcarrier are substantially equal.

16. A method as claimed in any of claims 2 to 14 in which the durations of the at least a pair of amplitudes of at least one subcarrier are different.

17. A method as claimed in any of claims 2 to 16 in which the durations are be quantised according to an associated clock signal.

18. A method as claimed in any preceding claim in which at least a pair of the plurality of subcarriers cooperate to define an associated plurality of phase states resolved according to mutually orthogonal axes.

19. A method as claimed in any preceding claim in which the plurality of phase states is associated with respective ranging signals.

20. A method as claimed in either of claims 18 and 19, in which dwell times in at least some of the plurality of phase states are unequal.

21. A method as claimed in any of claims 18 to 20 in which a first group of the phase states have a first dwell and a second group of the phase states have a second dwell time.

22. A method as claimed in any of claims 18 to 21 in which the dwell times are quantised according to a clock.

23. An m-level modulation signal comprising m signal amplitudes, where m>2, for modulating a first signal.

24. A signal as claimed in claim 23, wherein the plurality of signal amplitudes are associated with, or derived from, a plurality of phase states associated at least the m-level signal and, preferably, a second signal.

25. A signal as claimed in claim 24 in which the second signal has a predetermined phase relationship with the m-level signal.

26. A signal as claimed in claim 25 in which the predetermined phase relationship is a quadrature phase relationship.

27. A signal as claimed in any of claims 23 to 26 in which the m signal amplitudes comprises amplitudes representing a quantised sinusoidal signal.

28. A signal as claimed in any of claims 23 to 27 in which the m signal amplitudes are, or are in proportion to, at least one of the following sets of amplitudes $\{+1, +1/\sqrt{2}, 0, -1/\sqrt{2}, -1\}$, $\{-\sqrt{3}/2, -1/2, +1/2, +\sqrt{3}/2\}$, $\{(\pm\sin(67.5°), \pm\sin(22.5°), \pm\sin(22.5°), \pm\sin(67.5°)\}$, $\{\pm\cos(67.5°), \pm\cos(22.5°), \pm\cos(22.5°), \pm\cos(67.5°)\}$.

29. A signal as claimed in claim 28 wherein the signal amplitudes are selected to achieve a predetermined magnitude characteristic in a transmitted signal.

30. A signal as claimed in claim 29 in which the predetermined magnitude characteristic is a substantially constant envelope of the transmitted signal.

31. A digital modulation signal comprising three or more amplitudes

32. A binary offset carrier signal comprising m signal levels, where $m>2$.

33. A double binary offset carrier signals comprising n signal levels, where $n>2$, derived from the combination of at least a first BOC signal with at least a second BOC signal.

34. A BOCm(fs,fc) signal, where $m\geq 3$, where m represents a number of phase states associated with the BOCm(fs,fc) signal, fs represents the frequency of the BOC signal and fc represents the frequency of a further signal to be combined with the BOCm(fs,fc) signal.

35. A digital modulation signal comprising an m-level signal having m signal amplitudes combined with at least an n-level signal, where $m>2$ and $n\geq 2$.

36. A signal as claimed in any preceding claim wherein at least one of the signal amplitudes and phase states prevail for respective durations.

37. A signal as claimed in claim 36 in which at least a first plurality of the respective durations are unequal.

38. A signal as claimed in claim 37 in which at least a second plurality of the respective durations are equal.

39. A signal as claimed in claim 38 in which all of the respective durations are equal.

40. A set of modulated signals comprising at least one, and preferably both, of the following signals

$S_{L1i}(t) = A_m sc_i(t) m_i(t) d_i(t) \cos(\omega_i t) + A_C sc_i(t) g_i(t) d_i(t) \sin(\omega_i t) = I_{Si}(t) + Q_{Si}(t)$, and $S_{L2i}(t) = B_P sc_i(t) p_i(t) \cos(\omega_2 t)$ where A_P and A_C and Bp are the signal amplitudes, ω_1 and ω_1 are first and second carrier, preferably, L1 and L2 carrier, frequencies, $p_i(t)$ represents a first ranging code, preferably, comprising a pseudo-random sequence with a predeterminable chip rate of 10.23 Mbps and a predeterminable period of exactly 1 week, $g_i(t)$ represents a second ranging code, preferably a CA code, and, preferably, has a predetermined chip rate and is preferably a 1023 chip Gold code, $d_i(t)$ represents an optional data message, $sc_i(t)$ represents a sub-carrier signal comprising m amplitude levels, where m>2.

41. A signal as claimed in any of claims 23 to 40 having a predetermined relationship to a code signal such that a predeterminable number of portions of a cycle of the m-level signal occur for a predeterminable portion of the code signal.

42. A signal as claimed in claim 41 in which the predeterminable number of portions is a predeterminable number of half cycles.

43. A signal as claimed in either of claims 41 and 42 in which the predeterminable portion of the code signal is a chip.

44. A ranging system comprising means for generating a ranging code; means for generating a signal or implementing a method as claimed in any preceding claim; means for transmitting the signal.

45. A ranging system comprising means for generating a ranging code; means for generating carrier signal; means for generating a plurality of subcarrier signals and means for combining the ranging code, carrier signal and the subcarrier signals to produce an output signal.

46. A ranging system as claimed in claim 45 in which the means for the plurality of subcarrier signals comprises means for generating at least one subcarrier signal comprising a number, m, of amplitude levels, where m≥2.

47. A ranging system as claimed in claim 46 wherein the means for generating the at least one modulation signal comprises means for creating a signal having m amplitudes where m>2.

48. A ranging system as claimed in either of claims 46 and 47 in which m is selected from at least one of 3, 4, 5, 6, 7, 8 or 9.

49. A ranging system as claimed in any of claims 45 to 48 in which at least one of the plurality of subcarrier modulation signals approximates or is derived from a predeterminable basis waveform.

50. A ranging system as claimed in claim 49 in which the basis waveform is at least one of a sine wave, cosine wave, triangular waveform.

51. A ranging system as claimed in either of claims 49 and 50 in which the basis waveform is selected according to desired power distribution characteristics of the transmission signal.

52. A ranging system as claimed in any of claims 45 to 51 claim in which at least two of the plurality of subcarrier modulation signals are mutually orthogonal.

53. A ranging system as claimed in any of claims 45 to 52 claim in which the plurality of subcarriers are mutually orthogonal.

54. A ranging system as claimed in any of claims 45 to 53 in which the plurality of subcarrier comprises a pair of subcarriers having a predetermined phase relationship.

55. A ranging system as claimed in any of claims 45 to 54 in which the plurality of subcarriers comprises an in-phase subcarrier and a quadrature phase subcarrier.

56. A ranging system as claimed in claim 55 further comprising means for determining the respective multiple amplitudes of the in-phase and quadrature phase subcarriers to maintain a substantially constant transmission signal envelope.

57. A ranging system as claimed in any of claims 45 to 57 further comprising means for deriving the amplitudes associated with at least a pair of orthogonal subcarriers from a plurality of phase states.

58. A ranging system as claimed in claim 57, in which the phase states are equally angularly distributed around a unit circle.

59. A ranging system as claimed in any of claims 45 to 58 in which durations of the amplitudes of at least one subcarrier are substantially equal.

60. A ranging system as claimed in any of claims 45 to 58 in which the durations of the at least a pair of amplitudes of at least one subcarrier are different.

61. A ranging system as claimed in any of claims 45 to 60 in which the durations are quantised according to an associated clock signal.

62. A ranging system as claimed in any of claims 45 to 61 in which at least a pair of the plurality of subcarriers cooperate to define an associated plurality of phase states resolved according to mutually orthogonal axes.

63. A ranging system as claimed in any of claims 45 to 62 in which the plurality of phase states is associated with respective ranging signals.

64. A ranging system as claimed in either of claims 62 and 63 in which dwell times in at least some of the plurality of phase states are unequal.

65. A ranging system as claimed in any of claims 62 to 64 in which a first group of the phase states have a first dwell and a second group of the phase states have a second dwell time.

66. A ranging system as claimed in any of claims 62 to 65 in which the dwell times are quantised according to a clock.

67. A ranging system comprising means for transmitting, via a carrier, a ranging code combined with an m-level modulation signal comprising m signal amplitudes, where m>2, for modulating a first signal.

68. A ranging system as claimed in claim 67 wherein the plurality of signal amplitudes are associated with, or derived from, a plurality of phase states associated at least the m-level signal and, preferably, a second signal.

69. A ranging system as claimed in claim 68 in which the second signal has a predetermined phase relationship with the m-level signal.

70. A ranging system signal as claimed in claim 69 in which the predetermined phase relationship is a quadrature phase relationship.

71. A ranging system as claimed in any of claims 67 to 70 in which the m signal amplitudes comprises amplitudes representing a quantised sinusoidal signal.

72. A ranging system as claimed in any of claims 67 to 71 in which the m signal amplitudes are, or are in proportion to, at least one of the following sets of amplitudes $\{+1, +1/\sqrt{2}, 0, -1/\sqrt{2}, -1\}$, $\{-\sqrt{3}/2, -1/2, +1/2, +\sqrt{3}/2\}$, $\{(\pm\sin(67.5°), \pm\sin(22.5°), \pm\sin(22.5°), \pm\sin(67.5°)\}$, $\{\pm\cos(67.5°), \pm\cos(22.5°), \pm\cos(22.5°), \pm\cos(67.5°)\}$.

73. A ranging system as claimed in claim 72 wherein the signal amplitudes are selected to achieve a predetermined magnitude characteristic in a transmitted signal.

74. A ranging system as claimed in claim 73 in which the predetermined magnitude characteristic is a substantially constant envelope of the transmitted signal.

75. A ranging system combining means for creating a digital modulation signal comprising three or more amplitudes; means for producing a ranging code and means for combining the digital modulation signal with the ranging code.

76. A ranging system comprising means for generating a ranging code, means for generating a binary offset carrier signal comprising m signal levels, where m>2, and means for combining the ranging code with the binary offset carrier.

77. A ranging system comprising means for generating a double binary offset carrier signals comprising n signal levels, where n>2, derived from the combination of at least a first BOC signal with at least a second BOC signal; means for generating a ranging code; and means for combining the ranging code with the double binary offset carrier signal.

78. A ranging system comprising means for generating a BOCm(fs,fc) signal, where M≥3, where m represents a number of phase states associated with the BOCm(fs,fc) signal, fs represents the frequency of the BOC signal and fc represents the frequency of a further signal to be combined with the BOCm(fs,fc) signal; means for generating a ranging code and means for combining the ranging code with the BOCm(fs,fc) signal.

79. A ranging system comprising means for generating a digital modulation signal comprising an m-level signal having m signal amplitudes combined with at least an n-level signal, where m>2 and n≥2; and means for combining the digital modulation signal with a ranging code.

80. A ranging system as claimed claim 79 wherein at least one of the signal amplitudes and phase states prevail for respective durations.

81. A ranging system as claimed in claim 80 in which at least a first plurality of the respective durations are unequal.

82. A ranging system as claimed in claim 81 in which at least a second plurality of the respective durations are equal.

83. A ranging system as claimed in claim 82 in which all of the respective durations are equal.

84. A ranging system comprising means to generate a set of modulated signals comprising at least one, and preferably both, of the following signals

$$S_{L1i}(t) = A_m sc_i(t)m_i(t)d_i(t)\cos(\omega_i t) + A_C sc_i(t)g_i(t)d_i(t)\sin(\omega_i t) = I_{Si}(t) + Q_{Si}(t)$$

, and $S_{L2i}(t) = B_P sc_i(t)p_i(t)\cos(\omega_2 t)$ where A_P and A_C and Bp are the signal amplitudes, ω_1 and ω_1 are first and second carrier, preferably, L1 and L2 carrier, frequencies, $p_i(t)$ represents a first ranging code, preferably, comprising a pseudo-random sequence with a predeterminable chip rate of 10.23 Mbps and a predeterminable period of exactly 1 week, $g_i(t)$ represents a second ranging code, preferably a CA code, and, preferably, has a predetermined chip rate and is preferably a 1023 chip Gold code, $d_i(t)$ represents an optional data message, $sc_i(t)$ represents a sub-carrier signal comprising m amplitude levels, where m>2.

85. A ranging system as claimed in any of claims 44 to 84 having a predetermined relationship to a code signal such that a predeterminable number of portions of a cycle of the m-level signal occur for a predeterminable portion of the code signal.

86. A ranging system as claimed in claim 85 in which the predeterminable number of portions is a predeterminable number of half cycles.

87. A ranging system as claimed in either of claims 85 and 86 in which the predeterminable portion of the code signal is a chip.

88. A system for combining a plurality of signals to produce a modulated signal; the system comprising means for combining a multilevel modulation signal with a carrier to influence the energy distribution of the modulated signal wherein the energy distribution is influenced by at least one characteristic of the multilevel modulation signal.

89. A system as claimed in claim 88 comprising means for deriving the multilevel modulation signal from a plurality of signals wherein at least signal of the plurality of signals has a plurality of signal amplitudes.

90. A system as claimed in claim 89 in which the means for deriving the multilevel modulation signal from the plurality of signals is operable to combing at least two signals having respective pluralities of signal amplitudes.

91. A system comprising memory for storing at least one of a plurality of selectable phase states and selectable amplitude states; the memory being responsive to at least one of a ranging code signal, a system clock signal and a subcarrier signal to produce a carrier signal bearing at least one of phase and amplitude modulation to produce a transmission signal.

92. A system as claimed in claim 91 in which the plurality of selectable phase states are arranged to influence the power spectrum of a transmission signal.

93. A signal substantially as described herein with reference to and/or as illustrated in any of the accompanying drawings.

94. A system substantially as described herein with reference to and/or as illustrated in any of the accompanying drawings.

95. A method for signal generation or representation substantially as described herein reference to and/or as illustrated in any of the accompanying drawings.

96. A receiver system comprising means to process a signal as claimed in any of claims 23 to 43.

97. Computer readable storage comprising computer executable code for implementing or producing a method, signal or system as claimed in any preceding claim.